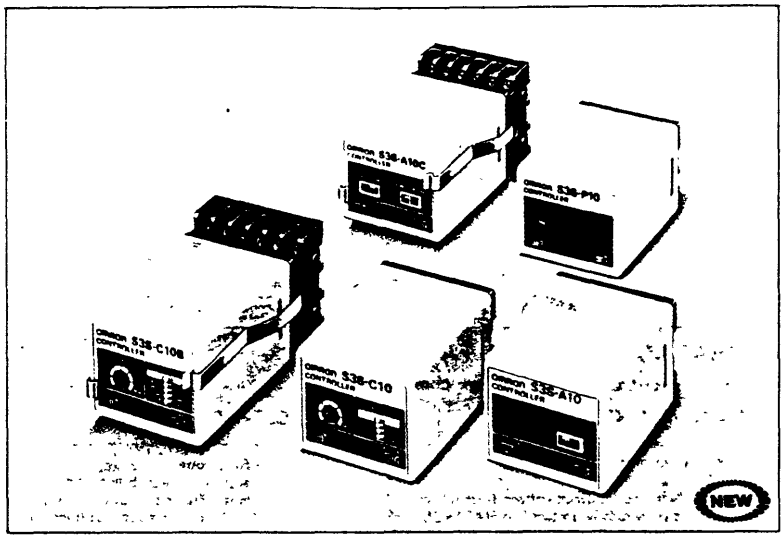
OMRON 170-544/5/6.

CONTROLLER UNIT

S3S

Miniature Power Supply With Control Functions



■ FEATURES

- Small size with 100mA DC output
- ON/OFF-delay, memory and one-shot delay operations are available in the same unit (S3C-C□)
- Types S3S-□□B and S3S-□□C allow easy selection of OR and AND operations. In addition, direct mounting on a track possible.
- LED operation and power indicators
- Wide operating temperature and voltage ranges
- Ideal for various sensors including proximity switches and photoelectric switches
- Any DC type sensor can be connected.
- Easy to wire

■ AVAILABLE TYPES

Control function	General purpose			Multi-function	Multi-function			Power
External power supply voltage	Standard operation with gate input			ON/OFF-delay/memory operation	ON/OFF, one-shot delay operation with gate input			Standard operation
Connected sensor output	12 VDC							24 VDC
Type	NPN voltage output	NPN open collector output	PNP output	NPN voltage output	NPN voltage output	NPN open collector output	PNP output	Contact output
Standard	S3S-A10*	S3S-A10C	S3S-A10B	S3S-B10*	S3S-C10*	S3S-C10C	S3S-C10B	S3S-P10*
Standard approved	S3S-A10-US*	–	–	S3S-B10-US*	–	–	–	S3S-P10-US*

NOTE: * These types are supplied with connecting sockets.

■ SPECIFICATIONS

OMRON

• RATINGS

Item		Type	S3S-A10(-US)	S3S-A10C	S3S-A10B	S3S-B10(-US)	S3S-C10(-US)	S3S-C10C	S3S-C10B	S3S-P10(-US)
AC input	Rated voltage	Standard	100/110/200/220 VAC, 50/60Hz							100/200 VAC or 110/220 VAC, 50/60Hz
		Standard approved	120/240 VAC, 50/60Hz							
	Operating voltage range		85 to 110% of rated voltage							90 to 110% of rated voltage
	Power consumption		8 VA max.							
DC input	Voltage		12 VDC ±10%							24 VDC ±10%
	Maximum current		100mA							
	Output voltage fluctuation due to:	Load	5% max							4% max.
		Supply voltage**	±0.5% max.							±1% max.
		Temperature***	±3% max.							
	Ripple		Refer to "CHARACTERISTIC DATA."							
	Regulation method		Switching							
	Short-circuit protection		Equipped							
Control output	Capacity	Standard	250 VAC 3A, SPDT relay contact (p.f.=1)							
		Standard approved	250 VAC 5A, SPDT relay contact (p.f.=1)							
	Delay time setting range		–			ON/OFF delay time: 0.1 to 1sec (variable)	ON/OFF, one-shot delay time: 0.1 to 1sec or 1 to 10sec (variable)	ON/OFF, one-shot delay time: 0.1 to 10sec (variable)		–
Signal input	Signal level		H: 4 to 12V L: 0 to 1V	ON: 0 to 2V OFF: 6 to 12V	H: 6 to 12V L: 0 to 2V	Positive polarity, H: 4 to 12V† L: 0 to 1V (for set and reset of inputs 1 and 2)	H: 4 to 12V L: 0 to 1V	ON: 0 to 2V OFF 6 to 12V	H: 6 to 12V L: 0 to 2V	Pull-in current: 30mA min. Release current: 1mA max.
	Input impedance		Approx. 4.7kΩ		Approx. 6.2kΩ	Approx. 4.7kΩ			Approx. 6.2kΩ	Approx. 1kΩ
	Input current		Sink	Source	Sink			Source	Sink	Source
	Minimum input time		20msec			Input 1 2msec Input 2 20msec	2msec (with timer at 1-sec range) 20msec (with timer at 10-sec range)	2msec		20msec

* Output voltage fluctuation due to load is measured at an ambient temperature of 20°C with the load changed within 0 to 100% one hour after the application of rated voltage to the controller unit.

** Output voltage fluctuation due to supply voltage is measured at an ambient temperature of 20°C with a 100% load within ±10% change of rated voltage one hour after application of power to the controller unit

*** Output voltage fluctuation due to temperature is measured at ambient temperatures ranging from −10 to +55°C one hour after the application of rated voltage to the controller unit and is expressed by percentage with the data at 20°C taken as 100

† 6 to 12V when the set input (Input 1) is used at an input time of 5msec max

NOTE All data related to characteristics are measured one hour after the application of power to the controller unit

Note: Shaded areas represent stocked lines. Please contact Omron for availability of other items.

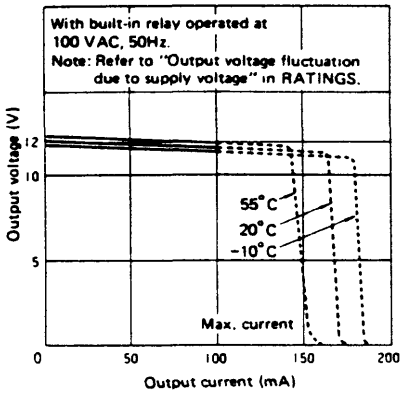
• CHARACTERISTICS

Insulation resistance	10MΩ min. (at 500 VDC) between AC input and DC output terminals and between current-carrying and non-current-carrying parts
Dielectric strength	2,000 VAC, 50/60Hz for 1 minute between AC input and DC output terminal and between current-carrying and noncurrent-carrying parts
Vibration	Mechanical durability: 10 to 30Hz; 1.5mm double amplitude (in X, Y, Z directions, respectively for 2 hours) Malfunction durability: 10 to 30Hz; 1mm double amplitude (in X, Y, Z directions, respectively for 2 hours)
Shock	Mechanical durability: 100m/sec² (approx. 10G's) (in X, Y, Z directions, respectively 5 times) Malfunction durability: 50m/sec² (approx. 5G's) (in X, Y, Z directions, respectively 5 times)
Ambient temperature	Operating: −10 to +55°C
Humidity	Operating: 45 to 85% RH
Service life (output relay)	Mechanically: 20,000,000 operations min. Electrically: See "CHARACTERISTIC DATA."
Weight	S3S-A□: Approx. 300g; S3S-B□/-C□/-P□: Approx. 320g

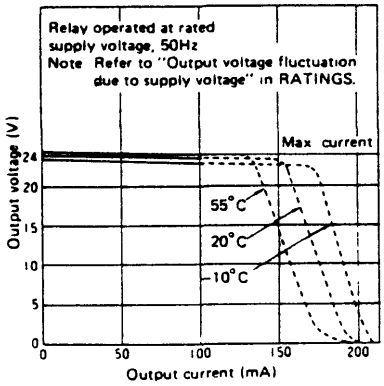
• CHARACTERISTIC DATA

Output current vs. output voltage characteristics

S3S-A10/-B10/-C10

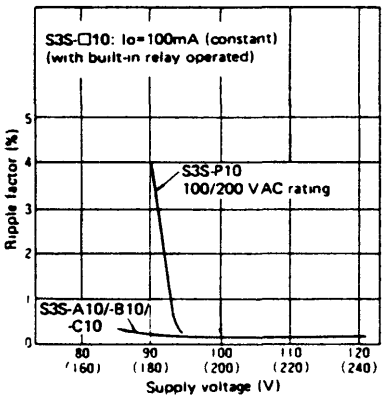


S3S-P10



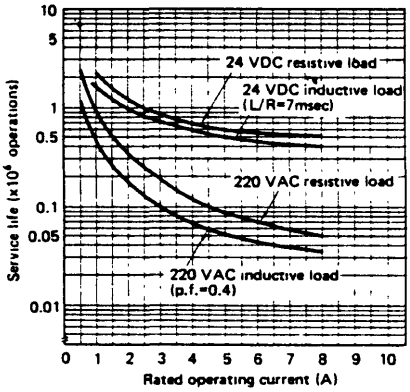
Supply voltage vs. ripple voltage characteristics*

S3S-A10/-B10/-C10/-P10



NOTE. Supply voltage values in ( ) apply to the 200/220 VAC rating.

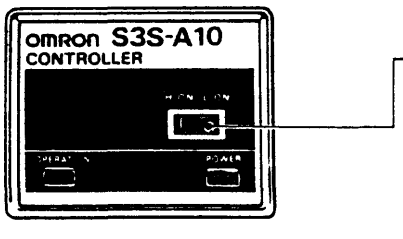
Electrical service life



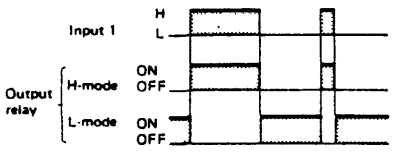
■ OPERATIONS (NOTE: For inputs 1 and 2 in the following diagrams, refer to "CONNECTIONS.")

• TYPE S3S-A10

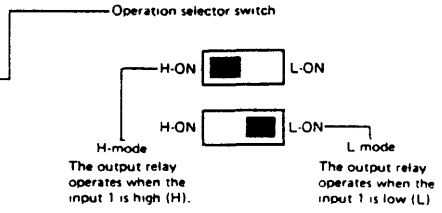
This controller unit performs two basic functions; one is to convert AC line voltage into a constant voltage of 12 VDC and supply the DC voltage to external devices such as proximity switches, photoelectric switches, etc., and the other is to provide relay contact output by driving the built-in relay with an external signal.



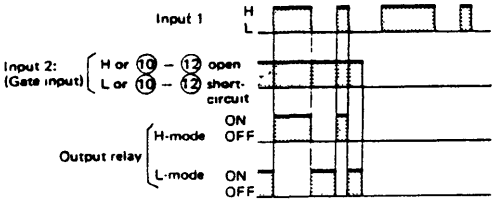
(1) When using input 1



NOTE: Leave input 2 terminal open.

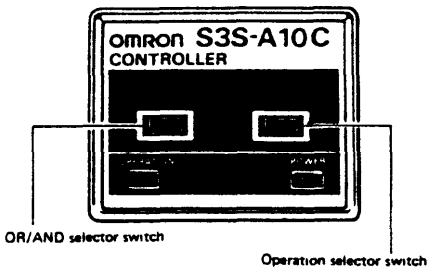


(2) When using both inputs 1 and 2 (Gate input operation)
Input 2 is used to perform gate input (AND) operation with input 1 or used as an output relay inhibit input.

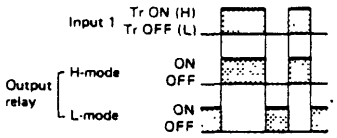


• TYPE S3S-A10C/-A10B

(The descriptions in parentheses apply to Type S3S-A10B.)
This controller unit allows selection of AND or OR operation in addition to the functions of Type S3S-A10.

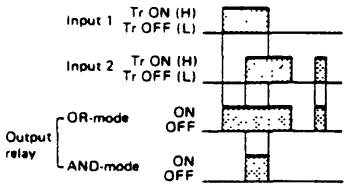


(1) When using input 1



NOTE: The OR/AND selector switch is set to the OR position.

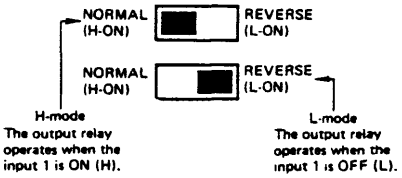
(2) When using both inputs 1 and 2



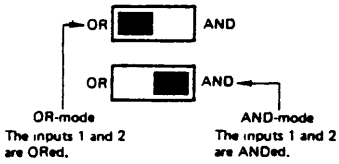
NOTE: The operation selector switch is set to the NORMAL (H-ON) position.

Selection method

- **Setting of operation selector switch**

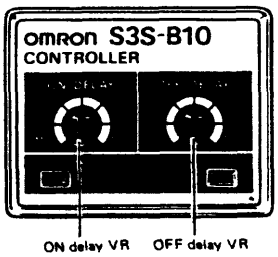


- **Setting of OR/AND selector switch**

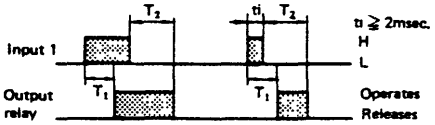


• TYPE S3S-B10/-B10-002

This controller unit performs ON-delay, OFF-delay and memory operations in addition to the function of the Type S3S-A10.



(1) ON-delay and OFF-delay operations

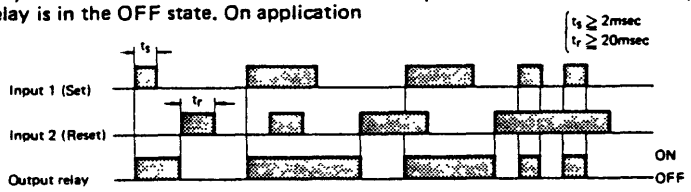


T_1: ON-delay time 0.1 to 1sec. (variable)
T_2: OFF-delay time 0.1 to 1sec. (variable)
$T_1 < T_2$

NOTE: Leave Input 2 terminal open.

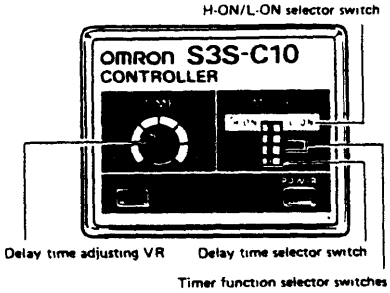
(2) Memory operation

The controller unit performs memory operation with signal input 1 used as the set input and signal input 2 as the reset input and with the ON/OFF delay variable resistor of the timer set at the "MIN." position. On application of power to the controller unit, the memory circuit is stabilized when the output relay is in the OFF state. On application of signal input 1, the memory circuit is placed in the set (relay ON) state, and on application of signal input 2, the circuit is placed in the reset (relay OFF) state. When both set (input 1) and reset (input 2) signals are input simultaneously, the set input takes precedence over the reset input.



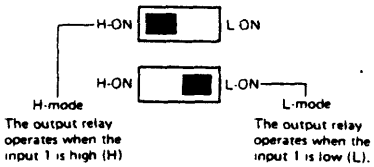
• TYPE S3S-C10

This controller unit performs ON-delay, OFF-delay and one-shot operations in addition to the function of the Type S3S-A10.

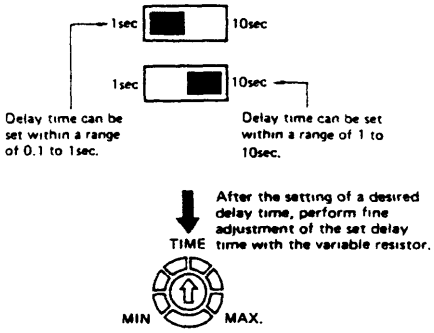


Selection method

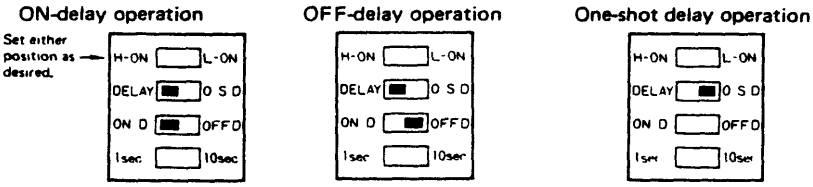
• Setting of H-ON/L-ON selector switch

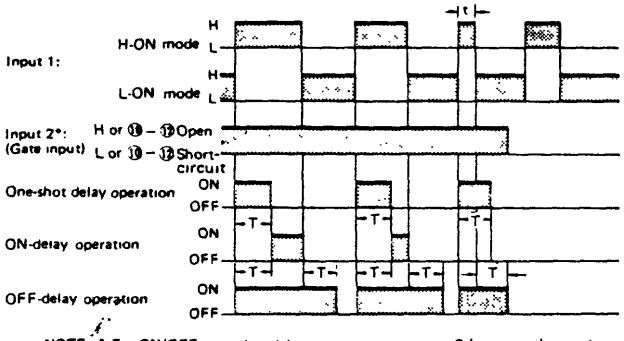


• Setting of delay time



• Selection of ON-delay, OFF-delay or one-shot delay operation

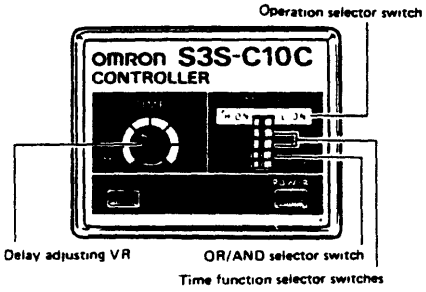




NOTE: * For ON/OFF-, one-shot delay operation, turn input 2 (gate input) on or leave the input 2 terminal open. When the level of input signal voltage at the input 2 terminal is low or the input 2 terminal is connected to 0V, the output relay releases without regard to the operation of the abovementioned input signal. The input 2 thus connected can be used as an inhibit signal. In this case, the ON/OFF-delay operation continues even if input 2 (gate input) becomes "Low" or terminals ⑩ and ⑫ are short-circuited during the delay operation, and the output relay is inhibited after the delay operation.

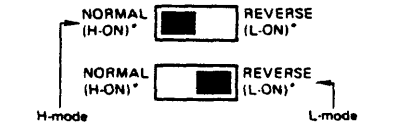
• TYPE S3S-C10C/-C10B

(The descriptions in parentheses apply to Type S3S-C10B.)
This controller unit performs ON-delay, OFF-delay and one-shot operations in addition to the function of the Type S3S-A10C/-A10B.



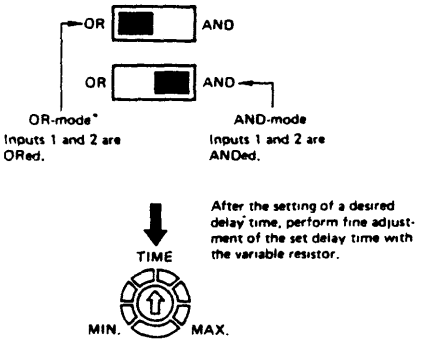
Selection method

• Setting of operation selector switch



* The legends "H-ON" and "L-ON" are for Type S3S-C10B.

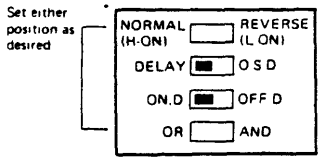
• Setting of OR/AND selector switch



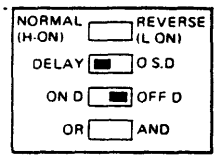
* When using input 1 only, set the selector switch to the OR position. The output relay does not operate if the switch is at the AND position.

- **Selection of ON-delay, OFF-delay or one-shot delay operation**

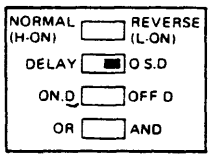
ON-delay operation

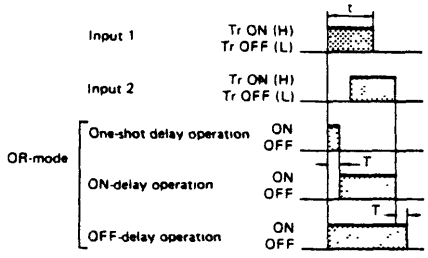


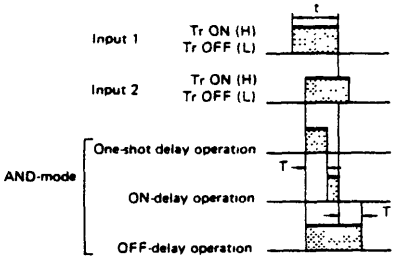
OFF-delay operation



One-shot delay operation





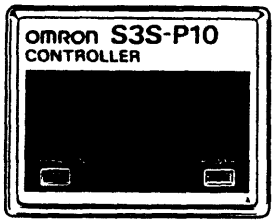


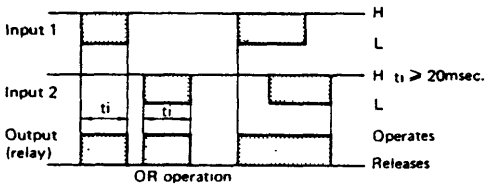
* The legends of the operation selector switch "H-ON" and "L-ON" parentheses are for Type S3S-C10B.
NOTE. The operation selector switch should be set to the NORMAL position.

t > 2msec
T Delay time

- **Standard operation, 24 VDC (S3S-P10)**

This controller unit performs two basic functions; one is to convert AC line voltage into a constant voltage of 24 VDC and supply the DC voltage to external devices such as proximity switches, photoelectric switches, etc., and the other is to provide relay contact output by driving the built-in relay with an external signal.

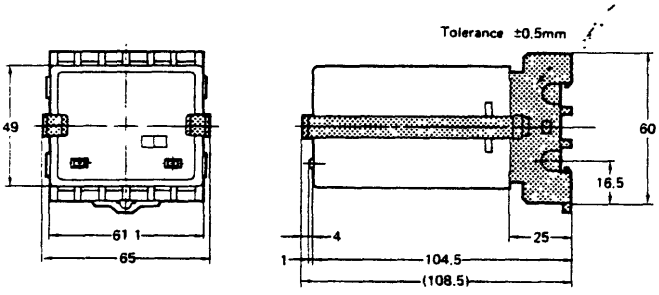




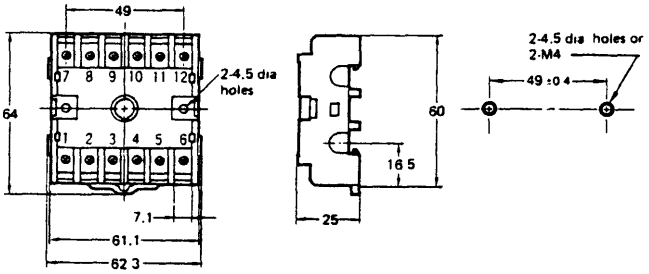
NOTE Bold line in input waveforms denotes that the sensor is in the ON state.

■ DIMENSIONS

- **CONTROLLER UNIT**



- **CONNECTING SOCKET (P2A-12BA)**

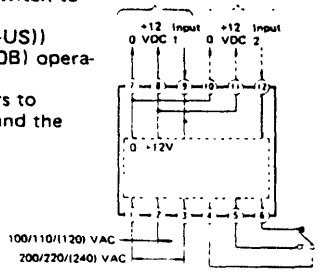


NOTE Each of these units (excluding S3S-□□8 and S3S-□□8) is supplied with Type P2A-12BA connecting socket and can be mounted on a track.

■ CONNECTIONS

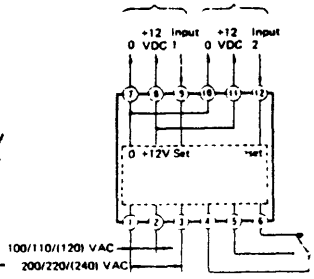
- **S3S-A□(-US)**

1. Basic operation
   (1) Use terminals ⑦, ⑧, and ⑨.
   (2) Do not use terminal ⑫
   (3) Terminals ⑩ and ⑪ can be used for DC power source.
   (4) Set the OR/AND selector switch to the OR position.
2. Synchronous input (S3S-A10(-US)) and AND/OR (S3S-A10C/-A10B) operations
   Connect one of the two sensors to terminals ⑦, ⑧, and ⑨; and the other to ⑩, ⑪, and ⑫



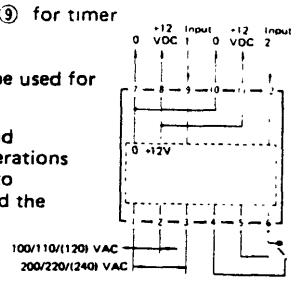
- **S3S-B□(-US)**

1. ON-, and OFF-delay operations
   (1) Use terminals ⑦, ⑧, and ⑨.
   (2) Never use terminal ⑫ as it is used for the memory operation only.
   (3) Terminals ⑩ and ⑪ may be used for DC power supply.
2. Memory operation
   (1) Be sure to set the ON- and OFF-delay variable resistors of the timer, respectively to the "MIN." position.
   (2) When the timer is not set at the "MIN." position, the timer may self-hold upon application of power. However, this should not be considered as trouble.
   (3) When set and reset signals are input simultaneously, the set input signal takes precedence over the reset input signal.



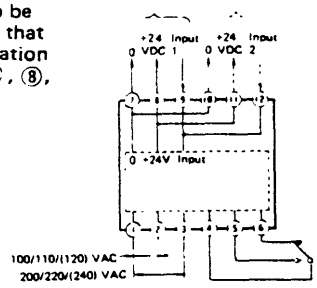
- S3S-C□(-US)

1. ON/OFF/one-shot delay operation
   (1) Use terminals ⑦, ⑧, and ⑨ for timer operation.
   (2) Never use terminal ⑫.
   (3) Terminals ⑩ and ⑪ may be used for DC power supply.
2. Synchronous input (S3S-C10) and AND/OR (S3S-C10C/-C10B) operations
   Connect one of the two sensors to terminals ⑦, ⑧, and ⑨; and the other to ⑩, ⑪, and ⑫.



- S3S-P10(-US)

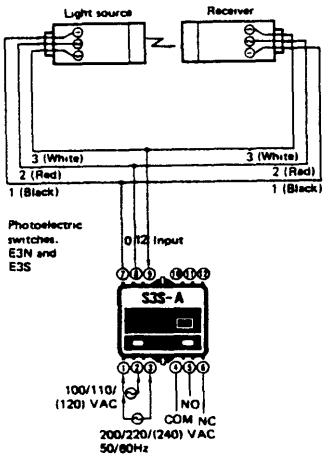
Terminals ⑩, ⑪ and ⑫ may also be used to connect another sensor. Note that the controller unit performs OR operation when two sensors are connected to ⑦, ⑧, ⑨ and ⑩, ⑪, ⑫, respectively.



■ APPLICATION EXAMPLES

• SINGLE-UNIT CONTROL

• For separate type photoelectric switch



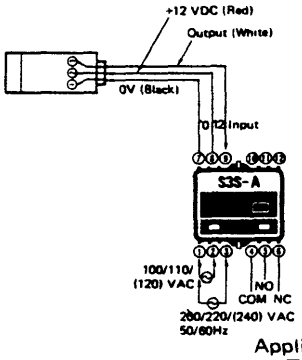
Applicable models for S3S-A10(-US)/-C10:
- E3N and E3S photoelectric switches

NOTE:
Use of S3S-□C/-□B is recommended for the current output type sensors.

Applicable models for S3S-□C/-□B
- E3S, E3H, and E3F photoelectric switches

NOTE:
If Type E3S-□E4 is connected to the controller unit, the ON/OFF operation of the output will be become the opposite of Type S3S-A10/-C10.

• For various electric switches



Applicable models for S3S-A10/-B10(-US)/-C10:
- TL, E2M, and E2K proximity switches
- E3N and E3S(-L) photoelectric switches
- E7A level switch
- Others

NOTE:
1. Use of S3S-□C/-□B is recommended for the current output type sensors (E3H, E3F, etc.)
2. Use S3S-B for timer operation. In this case, leave terminal ⑫ open.

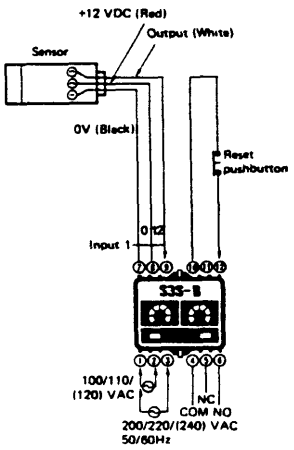
Applicable models for S3S-□C/-□B
- TL, E2M, and E2K proximity switches with the suffix "-□C□" or "-□E□" in their type numbers and to which a load relay can be connected.
- E3S, E3H, and E3F photoelectric switches
- Others

NOTE:
When connecting a sensor with the suffix "-□E□" in its type number and to which a load relay can be connected, the ON/OFF operation of the output will be inverted.

• MEMORY OPERATION

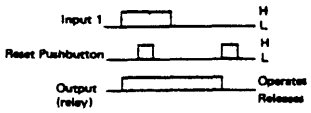
• For external resetting

Even if the sensor turns off, the output relay remains in the operate state until the reset button is turned off. Therefore, this example is ideal for burglar prevention, abnormality alarm, etc.



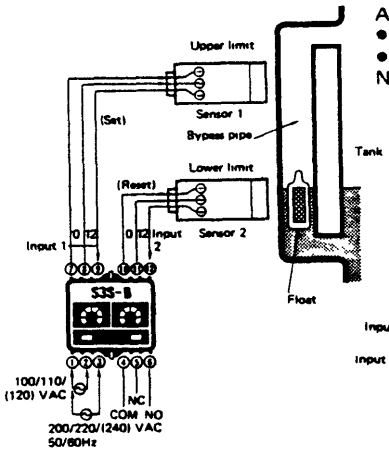
Applicable models:
- Proximity switches
- Photoelectric switches
- Solid-state level switches

NOTE:
When the sensor remains in the ON state, the output relay does not release even if the reset button is turned off.



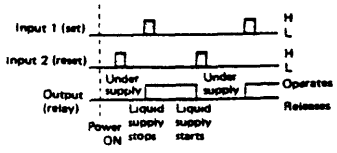
• 2-position control

For level control and positioning control in reciprocating operation



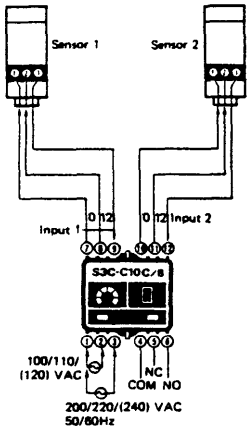
Applicable models:
- Proximity switches
- Solid-state level switches

NOTE:
For signal application to the tank, use the N.C. contact of the output relay.



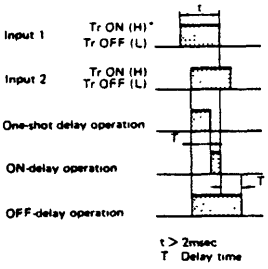
• AND OPERATION

When two sensors are directly connected to S3S-□C/-□B with the OR/AND selector switch of the controller unit at the AND position, the output turns ON only when both the sensors are in the ON state. (The operation selector switch is set to the NORMAL (H-ON) position.)



Applicable models:
- Proximity switches and photoelectric switches of current output or voltage output type to which a load relay can be connected.

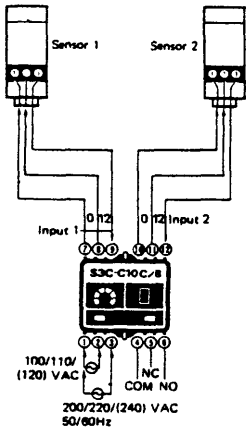
NOTE:
When the voltage output type sensors to which a load relay can be connected is connected to the controller unit, the ON/OFF operation of the output is inverted.



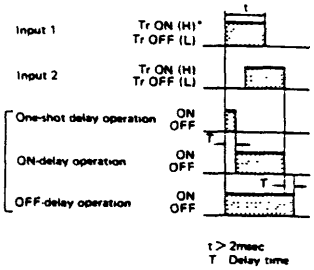
* The character "H" or "L" in parentheses indicates the output state of S3S-□B

• OR OPERATION

When two sensors are directly connected to S3S-□C/-□B with the OR/AND selector switch of the controller unit at the OR position, the output turns ON when either of the sensors is in the ON state. (The operation selector switch is set to the NORMAL (H-ON) position.)

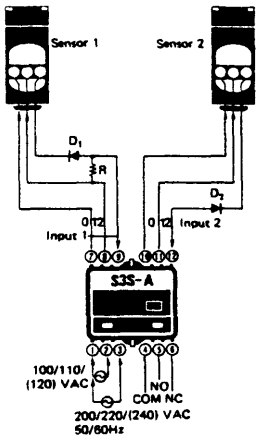


Applicable models
- Proximity switches and photoelectric switches of current output or voltage output type to which a load relay can be connected.



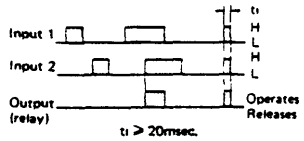
* The character "H" or "L" in parentheses indicates the output state of S3S-□B.

For length detection and displacement identification
In this example of circuit consisting of plural sensors, Type S3S-A10 controller unit, resistor, and diodes, output turns ON only when each sensor is in the ON state.

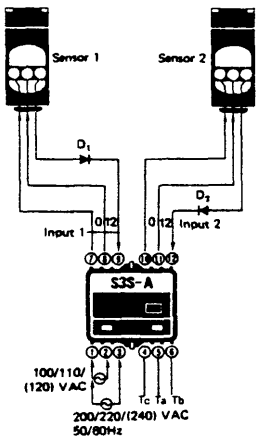


Applicable models:
- Proximity switches
- Solid-state level switches
- Others

NOTE:
1. R = 10kΩ
   D_1, D_2 = Diodes
2. When the sensors 1 and 2 can be wire ANDed, D_1, D_2, and R are not required.

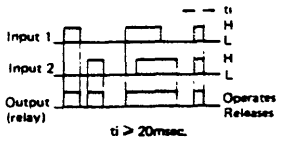


For extended detecting range
In this example of circuit consisting of plural sensors, Type S3S-A10 controller unit, and diodes, output turns on when any of the sensors is in the ON state.

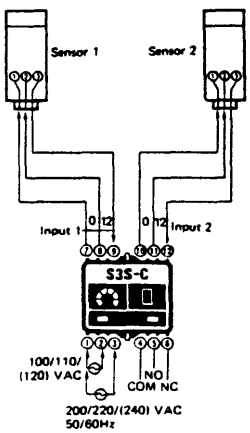


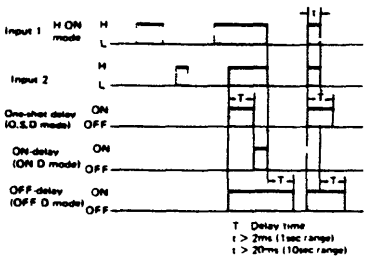
Applicable models:
- Proximity switches
- Solid-state level switches
- Others

NOTE:
1. D_1, D_2 = Diodes
2. Use of an open collector type sensor with S3S-P controller unit permits OR operation without connecting diodes D_1 and D_2.



When two sensors are directly connected to the Type S3S-C10 controller unit, the output relays operates only when both sensors are in the ON state (with mode selector set to H-ON).





In this example of circuit consisting of two sensors, Type S3S-C10 controller unit, and diodes, output turns on when either of the sensors is in the ON state.